THE

VETERINARY JOURNAL

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Obituary

THE LATE DR. JOHN GUNION RUTHERFORD, C.M.G., D.V.Sc.

By the death of Dr. Rutherford the Dominion of Canada, as well as the veterinary profession, have lost a valued adviser, and one whose name was almost as well known to his colleagues in the British Isles as amongst those in Canada. Born in 1857 at Peebles in Scotland, the son of a Presbyterian minister, he was educated in Glasgow and went to Canada in 1875, taking up the study of agriculture in the Ontario Agricultural College. In 1877 he entered the Ontario Veterinary College, graduating in 1879 with the highest possible honours and the Gold Medal for General Proficiency. He practised at various places, and eventually settled down at Portage la Prairie, Manitoba, being elected President of the Manitoba Veterinary Association. In 1892 he was elected to the Manitoba Legislature, and in 1896 he entered the House of Commons at Ottawa as Liberal Member for the constituency of Macdonald. During the whole of this time and until the end of 1900 he continued his veterinary practice. In Parliament his word was always listened to, and he was noted for the common sense of his opinions. It was largely owing to his influence that the Grain Act of Canada was passed through, and he was also one of the first to advocate the creation of a Board of Railway Commissioners, his name ultimately occupying one of their highest official positions. In 1901 he came to Great Britain as Special Veterinary Officer of the Dominion Government to inspect and tuberculin-test all pure-bred cattle

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intended for export to Canada, and on his return in 1902 he was appointed Veterinary Director-General, occupying this position until 1912. His *régime* was most active and successful in the eradication of animal disease, and for his brilliant services the King in 1910 honoured him with the Companionship of Saint Michael and Saint George. In 1912 he resigned his position as Veterinary Director-General and became Superintendent of Agriculture and Animal Industry for the Canadian Pacific Railway, and it was whilst on a journey in connection with his duties as an official on the Board of Railway Commissioners that he was attacked with his last illness. The Royal College of Veterinary Surgeons had made him an Honorary Associate. The American Veterinary Medical Association had elected him as one of their Presidents, and the University of Toronto at a Special Convocation held on June 3, 1920, conferred on him the Honorary Degree of Doctor of Veterinary Science, he being the first recipient of this distinction. In educational matters he was always to the front, and as a Liaison Officer between the members of the profession in Canada and Great Britain he did sterling work. His death has left a blank which it will be difficult to replace.

Editorials

THE FIELD DISTEMPER FUND AND THE DAILY PRESS.

As is well known, during the past few months an effort is being made to raise the sum of at least £15,000 for the purpose of a serious (and, if necessary, prolonged) investigation into the cause and preventive treatment of that curse of the canine world—distemper. On numerous occasions during the past few years the VETERINARY JOURNAL has drawn attention to the great need for this, and Sir Theodore Cook, the Editor of the *Field*, has given his whole-hearted support and the columns of his paper to the scheme. The Veterinary Press have loyally seconded his efforts, as have also the purely Canine Press, *Our Dogs* and the *Dog World*. American newspapers, lay and sporting, are helping too, and have already sent a preliminary cheque for £1,000, while a second £1,000 is well on the way. Now a further ally in the shape of our powerful contemporary, *The Daily Telegraph*, has come to our aid, and is devoting a whole column of its space on the editorial page of the paper to articles on the subject from that well-known breeder and fancier, Mr. Croxton Smith, and others. This paper has developed the idea that the prospective canine sufferers themselves and their animal (and even bird and insect) friends shall contribute something, and every day the postman takes up bags of correspondence

and shoals of postal orders. The Fund is going strong, and there is every reason to think that the monetary object will be shortly attained ; and it is for the individual members of the profession to support it as much as possible, and to make it known amongst their canine clientele. It is the greatest effort which has ever been made to raise funds from private sources for research into this dire disease ; and as the matter has been placed in the hands of one of our own profession, aided by a number of specialists of the Medical Research Council, and the money has been subscribed freely by a willing public, it is for us, collectively and individually, to forward the Scheme in every possible way. That it may eventually be crowned with success is the earnest wish of everybody—client and practitioner.

THE DICK COLLEGE CENTENARY RESEARCH SCHOLARSHIP.

As this is the last occasion on which we can get an opportunity to officially draw the attention of our readers to the efforts being made to celebrate the Centenary of the Dick Veterinary College in a manner which will benefit the new graduate, we again press the urgent need for every member of the profession to do his utmost to give it his support. The 29th and 30th of this month, and the 1st of December, will be busy days for the Edinburgh College authorities and students, and we especially draw attention to the Ulster Stall Bazaar announcement in our advertisement pages, for which books of tickets can be obtained from that energetic and enthusiastic worker for all professional advancement, Mr. J. Ewing Johnston, M.B.E., M.R.C.V.S., May Street, Belfast.

THE VALUE OF THE STOMACH TUBE IN DAILY PRACTICE.

THE use of the stomach tube in veterinary practice is becoming more and more popular, and its value is undeniable. A recent article in our contemporary *The Veterinary Record* from the pen of Mr. Trevor Williams is a further testimony to its value in horses and cattle ; and his words, " my opinion of the stomach tube after an extensive experience during the last three years in the horse, and over two in bovines, is that it is indispensable to the practitioner. In addition to its marvellous results it reduces the drug bill by half." In the VETERINARY JOURNAL for October, an article by Messrs. Hill and Bristow testified to its value in auto-intoxication of cattle, in colic, in strongylosis, and in cases of emaciation and debility. In fact the pioneer work done by Professor Imrie and Captain Lang, in introducing

and persistently keeping this method of administration in front of the general practitioner, is now bearing fruit in every direction ; so that it must of necessity become part of the routine teaching for the students in our colleges. It is curious that " there is nothing new under the sun," for the idea of the use of the stomach tube in certain diseases was thought of and written about by Major-General Sir Frederick Smith as early as 1883. In the *Quarterly Journal of Veterinary Science, India,* vol. i, p. 513, there is an article by this talented author on " Dilatation of the Stomach," and a suggestion was made for a stomach tube (termed an œsophagus tube) intended to pass through the mouth. This article states : " I have dealt with the treatment of my œsophagus tube last not because I consider it as a last resource, but because I have had no opportunity of using it since Messrs Arnold provided me with one. I consider this tube would replace all other means, not excepting puncture. It cannot fail to act because it overcomes immediately the anatomical conditions which prevent vomiting. The tube ensures the exit of the imprisoned cause, and it requires no effort of imagination to see what must follow as the result of the introduction into a tympanitic stomach : The rush of gas ; the sigh of relief—a very tempting picture to paint, but we must fain wait awhile until we have witnessed its practical results."

Even further back in the history of veterinary medicine one finds a quotation by that keen clinical observer Percival (*Hippopathology,* part 2, vol. ii, 1855,* " Diseases of the Digestive Organs of the Horse ") : " There is, however, yet another mode of attempting to accomplish the same end, and that is by endeavouring to pass a hollow elastic tube down the œsophagus into the stomach, and through it, by means of the stomach pump, to inject tepid water." " Would the introduction of œsophagus tube into the stomach prove practicable and turn out of any service ? " " Undoubtedly, in the present state of science, the immediate introduction of the stomach tube into the stomach, through which, as quickly as possible, warm water might be injected and withdrawn until we have completely washed out the stomach."

This was written in 1855. Is it not curious how history repeats itself, and the same, or similar, ideas, keep cropping up through the brains of succeeding generations ? At the same time, it is not the man who merely suggests an idea who benefits humanity the most, but the man whose perseverance and persistence causes it to become " un fait accompli."

* Pages 262, 264, 282.

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General Articles

THE EXAMINATION OF THE CAMEL FOR SOUNDNESS, WITH INDICATIONS AS TO ITS AGE.

By D. S. RABAGLIATI, O.B.E., B.Sc., F.R.C.V.S., Major, late R.A.V.C.
Director, Serum Institute, Ministry of Agriculture, Egypt.

During the Great War it was the privilege of the writer of this article to command a Camel Veterinary Hospital in Egypt, when more than 25,000 camels passed through his hands. The camels were all of the one-humped variety, and included those from Egypt, the Sudan, India, Tripoli, Algeria, Morocco, Tunis, Arabia, and Somaliland. He was greatly struck with the number of animals which found their way to hospital owing to faulty conformation and chronic conditions, which no doubt might have been avoided to some extent had it been possible to give more care and attention to their examination before purchase. It was also forcibly brought home to members of the veterinary staffs of camel units that accurate knowledge on the ageing of camels was deficient, and the literature on the subject woefully inadequate and conflicting. The object of these notes is to put in a clear, practical, and concise manner what the author considers to be the best method of examining a camel for soundness, what defects and diseases to look for, and to give a résumé of his observations extending over several years on Camel Dentition. The writer has no experience with the two-humped or Bactrian camel, and all his observations refer only to the one-humped variety.

General Examination.

It must be taken for granted that the examiner, has made up his mind as to the type and kind of camel required, taking into account the work expected of it and the conditions under which it has to live, before he commences a systematic examination for suitability and soundness.

The camel can be led up to the examiner, who can first of all make a general cursory examination of the animal. He must note its general condition and appearance, whether its abdomen is full or "tucked-up," the state of its muscular development, the breed, sex, colour, distinctive markings, tribal brands and firing marks, both the latter being very important features in camel practice.

The age may now be ascertained in docile animals, but with nervous or restless ones it is easier to examine the teeth in the kneeling or "barrakking" position.

The height, which can be measured either from the withers or

the top of the hump, can be taken at this stage if desired, but in camel practice this is rarely carried out.

The attendant may next be made to walk the camel past the examiner once or twice, so that its carriage and method of locomotion can be seen. This should be free, level, with an easy movement of the joints; there should be an absence of "elbow-brushing," lameness, or any other peculiarity in gait. The head should be carried high, with the bridge of the nose held up to almost, if not quite, the level of the poll. A head held too low with drooping nose is usually indicative of fever or general ill-health. A more detailed examination of these points must, of course, be made later, should the camel be deemed worthy of further examination. In this case, the camel must again be brought to a standstill in front of the examiner, who proceeds with his examination in the following order.

Examination of the Skin.

The examination of the skin can be conveniently carried out at this stage. This should be soft, elastic, and pliable, covered by fine hair, or in some cases by thick wool, depending upon the breed and age. Camels with a "hide-bound" skin should be critically examined, as this often indicates the presence of trypanosomiasis, tuberculosis, filariasis, or other similar conditions.

The skin must be free from pimples, pustules, or excoriations, which when present along with loss of hair and thickening or dermatitis, usually indicate the presence of mange.

Mange is probably more common in the camel than in any other domestic animal, and is due to a sarcopt, *Sarcoptes communis, var. cameli*. The common sites of infection are the nose, lips, chest, axillæ, thighs, flanks, and perineum, but it may occur on any part of the body. Whether a camel should be rejected for mange or not must depend upon the severity of the case, whether recent or of long standing, the number of camels required, the possibility of treating it after purchase, the chance of finding sufficient clean camels, and so on. When a camel suffers from severe mange, however, it must be considered distinctly unsound.

"*Latia*," "*Lathia*," *or* "*Jhooling*."—This is the name given to a peculiar kind of septic sore which occurs in camels, chiefly in India, giving rise to round, blackish, raised areas of dead skin denuded of hair, not unlike "sitfasts," and usually containing pus underneath. The lesions may occur on any part of the body, but are more common on the neck, hump, and thighs. Though the condition is usually easily cured, it is liable to recur, is to some extent contagious, and must be classified as an unsoundness. When the lesions heal, distinct

scars are left, which should draw attention to the disease having been present, and the examiner must use his discretion as to whether the camel be passed or rejected.

Nodules caused by the Nematode Worm, Onchocerca fasciata.—A camel may have numerous hard, fibrous, subcutaneous nodules due to this parasite scattered about the body, in size from that of a bean to a walnut. They occur on the neck, trunk or limbs, or they may be generalised. They never suppurate nor cause loss of hair, and unless very numerous in the region of the knee or hock—where they may interfere with the movement of the joints—they may be ignored. These nodules are mostly to be found in Sudanese camels, and the worst that can usually be said of them is that they are unsightly. It is not infrequent to find such nodules showing scars due to native owners having cut them with a razor.

Camel Pox (*Variola cameli*).—This is a common and usually mild disease in the camel, giving rise to lesions which bear a close resemblance to those of variola in other animals. The lesions occur mostly on the nose, lips, around the eyes, on the perineum and thighs, though some cases may be generalised. Being a contagious disease, its presence constitutes unsoundness while it lasts. Old lesions may take on a wart-like condition. Care must be taken not to mistake for camel pox excoriations on the lips due to the camel having eaten prickly shrubs. The same remark applies to scars on the scrotum and perineum caused by ticks.

Warts.—Some camels suffer severely from warts. When it is thought that these may be rubbed raw by the saddlery, they should cause the rejection of the animal.

Lice.—Camels may harbour lice, the commonest being a species of *Hæmatopinus*. The symptoms and lesions caused are similar to those in other animals.

Ticks.—Numerous species of ticks infest camels, though it is not proved that they carry disease. In Egypt the commonest is *Hyalomma ægyptium*. Cross * suggests that ticks may be a means of carrying trypanosomiasis. When ticks are numerous and the means of ridding the animal of them are not readily available, it would be better to reject the camel rather than run the risk of infecting clean premises with this pest.

Method of Restraint.

Most broken-in camels can easily and safely be handled by one attendant holding the leading rope and another catching hold of

* Cross, H. E., and Patel, P. G.: "A Note on the Transmission of Surra by Ticks." *Dept. Agric. Punjab Vet. Bull.*, No. 6, 1921.

the tail and bending it upwards and forwards over the croup, as in this position very few camels can kick. Violent and rough measures of restraint should always be avoided whenever possible, as the animal is only excited thereby. It may, however, be necessary in some cases to tie the fore legs, or even the hind ones too, by means of a noose when the camel is in the kneeling or "barrakking" position.

"BARRAKKING" OR KNEELING DOWN.

At this stage the camel may be "barrakked" by pulling at the head-rope and gently tapping the posterior aspect of the forearms just above the knees, or even the upper part of the posterior third of the neck. Natives in Egypt usually make the sound of "Nikh, Nikh" at the same time. The normal method of "barrakking" is for the camel to drop first on to one knee and then on to the other. It then gradually lowers itself down until the sternal pad touches the ground, the anterior edge of the pad being the first part to come into contact. This ought to be done in one gradual movement. When the stifle pads reach the ground, the camel brings its shoulders forwards, the knees rubbing along the ground. The fore and hind feet are then tucked in under the body and the hocks bent in extreme flexion. The action is now complete. The fore feet are placed at the sides and slightly anterior to the sternal pad, the soles being uppermost. The hind feet rest on the ground and the points of the hocks may either just rest on the ground or be slightly raised up. In the "barrakking" position the chief weight of the body is borne by the sternal pad, less by the stifle and elbow pads, and only very little by the hind feet. A great deal can be learnt by an expert in watching a camel "barrak." A camel should rest comfortably on the ground without moving from side to side; uneasiness and inability to keep still are abnormal, and may be due to a variety of causes, such as sore pads, sore feet, disease of the limbs, or to abdominal pain. Inability to drop down quickly, accompanied by cries of pain or fear and a trembling of the muscles of the loins and flanks, is termed "kumri" by Indians, but has nothing to do with the "kumri" of the horse described by Macalister and others.* This condition is often due to disease of the articular surfaces of the stifle or shoulder joints, stiffness or anchylosis of the spine, or to any condition which produces pain on movement. Camels occasionally make ineffectual efforts to go down for some time, and then suddenly drop to the ground with a thud. There is a condition

* Macalister, G. H. K.: "Kumri combined with Diffuse Sclerosis and Central Polyomyelitis of Horses." *Mem. Dept. Agric. of India Vet. Series*, vol. ii, No. 8, June 1917.

described by the writer in Somaliland camels, to which he gave the name polyarthritis,* which sometimes makes " barrakking " impossible in bad cases, the camel actually falling over on its side instead of coming down on the sternum. Going down unevenly is often due to lameness and disease of the pads, and should make the examiner take special note of these points in his subsequent examination. Shoulder lameness is suggested when the camel is unable to push its fore legs forward easily, and stifle and hock lameness by difficulty in lowering the hind quarters.

The Temperature.

It is recommended that the temperature be taken if a critical examination is being made, as this may aid in the diagnosis of trypanosomiasis or other disease. The normal temperature varies within rather wide limits, from about 97° F. in the early morning to about 101° F. in the evening. If the temperature exceeds 99° F. in the morning or 102° F. in the evening, this indicates fever, and the camel should be rejected. At midday the temperature stands about half-way between these extremes.

The Pulse and Respiration.

The pulse may be felt best at the posterior tibial artery, but it is liable to variation and is not a very valuable guide. Its frequency should be from 45 to 50 per minute.

The respirations are usually between 5 and 7 when at rest, but should not exceed 12 per minute.

Examination of the Head.

The head can be examined to the best advantage while the camel is down. It should be carried easily with the nose well up and must not be too large, which indicates lack of breeding; this is of more importance in the finer breeds of riding camels than in the case of the heavy baggage variety. The forehead must be broad, ears well set on, pricked up and not drooping.

The Face.—The nose should be free from discharge, with pink mucous membrane, and the ala of the nostrils intact. Nasal catarrh may be due to common cold, in which case the discharge is serous or mucoid; or it may be due to the presence of bots in the nasal cavity, the larval stage of the fly *Œstrus cameli*. Many hundreds of these parasites may be present in the posterior nares and pharynx. Only when they are extremely numerous, or when serious lesions

* Rabagliati, D. S.: " Polyarthritis in Camel." *Journ. Comp. Path. and Therap.*, vol. xxxvi, part ii, June 1923.

have been produced by them, is it necessary to reject the camel on their account. When purulent, the discharge may be due to pus in the sinuses of the head, necrosis of the turbinated bones, or to defective teeth. A most characteristic symptom of pus in the sinuses of the head or in the posterior nares is for the camel to hold its head up continuously, so high as to be in a straight line with the neck. These conditions are all quite common ones in the camel. Nasal catarrh must always be considered an unsoundness.

Torn nostrils are frequently caused by ropes, wires, or nose-pegs put through the nose, and in some cases indicate vice, such as running away—an important matter in riding camels. Severely torn nostrils render a camel unfit for desert work, as they prevent it from closing its nose against blowing sand.

The bridge of the nose must be carefully examined for wounds. Chronic sores only partly healed may be present, sometimes leading to deep sinuses running into the bones of the face. These are most common over the frontal and nasal bones, and are often due to faulty nose-bands or to camels being vicious and difficult to handle and restrain. It is quite common to find fractured or even necrotic pieces of bone covered up by a partly healed wound, and only careful examination can detect the presence of a narrow sinus into which sometimes a small probe can only be passed with difficulty. Such conditions are liable to be overlooked by the novice, but are often the source of much trouble later on. When such as these are present, they should cause rejection. Bulging and softening of bones in the facial region often indicate pus in the sinuses of the head.

Tumours and exostoses may occur on the bones of the head and face, especially on the lower jaw in the region of the canine teeth. This is the most vulnerable portion of the camel's jaw, and partial fractures with subsequent calluses, which may be imperfectly healed, must be looked for. They are caused either by blows or are due to injuries from the chains of the nose-bands.

Some camels store a bolus of food between the molar teeth and the cheek during rumination. These masses, which at first sight may be taken for tumours, are liable to deceive the uninitiated. By pressing on the cheek over such a mass the food is easily dispersed.

The Eyes.—Perhaps no better indication of the general health can be obtained than from the condition of the eyes. These should be clear, bright, free from all traces of discharge, and the conjunctiva should be pinkish in colour. A chronic discharge from the eyes is very common, and not infrequently a sign of trypanosomiasis. The eyes can be examined by catching hold of the head-rope, or if necessary the upper lip, and bringing the head to face the light. Note if the

skin above the eyes is clean and healthy looking or if corrugated, rough and puckered, conditions which are often the result of mange.

Cataracts in the camel are of common occurrence, and can be detected by the usual methods employed in equine practice. Whether their presence should lead to complete rejection must depend upon their extent and the class of camel required.

Entropion and trichiasis are of common occurrence in aged camels, especially in Sudanese, but they may occur in other camels and at any age. They always produce conjunctivitis, and if neglected are liable to cause ulceration or opacities of the cornea, and may even lead to blindness. Wounds over or on the eyes are only too common, and rupture of an eyeball or loss of one eye frequently occur as the result of blows inflicted by attendants, or due to injuries from prickly trees and shrubs.

Amaurosis is of common occurrence, and Leese describes the presence of a small worm, *Thelazia leesei*, in the conjunctival secretion, to which, however, he attaches but little importance.

Loss of one eye is not so serious in a baggage as in a riding animal, but a totally blind camel is of no use for work. Blindness can also be detected by the peculiar way a blind camel walks, lifting its legs slowly and high, and by seeing whether it will walk into a wall, tree, or other object when left alone.

The Ears.—Unhealed wounds of the outer ear are often difficult to heal, and should cause rejection.

A chronic discharge from the auditory meatus, or otorrhea, is sometimes met with. This can be detected by firmly grasping the base of the ear and squeezing it. If it gives a crackling sound like tissue paper, it indicates the presence of catarrh. In severe cases the camel holds its head to one side, the outer ear is much inflamed and swollen, and there may be ulceration of the auditory meatus. This condition is very serious, and usually indicates disease of the bones of the inner ear. Ostitis of these bones may produce facial paralysis by pressure on the nerves, which affects the lips of the affected side. Such paralysis is usually incurable, and the camel should be rejected.

The Mouth.—The mouth can easily be examined by catching hold of the upper lip with the left hand and with the right opening it by inserting the hand into the mouth behind the "tushes," at the same time turning the head towards the light. No animal allows its mouth to be examined more easily, and a gag is rarely necessary. The chief difficulty is that the camel is apt to fill its mouth with regurgitated food. This, however, can easily be washed away with a little water so that the buccal cavity can easily be seen. The

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camel has an inconvenient but common habit of spluttering the food from its mouth into the face of the examiner, much to his discomfiture, should he not guard against this possibility.

The tongue and mucous membranes must be examined for wounds, especially the palatal flap or expansion, commonly known as the " bladder." The condition of the teeth can now be seen, and the tongue, if necessary, can be firmly grasped and moved from side to side if desired. Disease or irregularities of the teeth must be looked for, as these are apt to be serious.

The Teeth as Indicative of Age.*

As in the horse, the teeth are examined to ascertain the age of the animal. No camel is fit for hard work until it is at least six years old, and therefore, if required for immediate work, should have four permanent incisors up in the lower jaw. The camel may be considered at its prime at from seven to twelve years of age.

The camel has twenty-two deciduous or milk teeth in the temporary mouth and thirty-four permanent ones in the adult. The arrangement and number of teeth are the same in the female as in the male, except that in the former the " tush-like " teeth are smaller and less well developed.

The teeth of the adult camel are peculiar in that the corner incisors of the upper jaw—there are no centrals nor laterals—and the first pair of premolars, both above and below, are modified to take the shape of canines. Thus it would appear that there are six " canine " or " tush-like " teeth in the upper jaw and four in the lower.

The age of the camel is usually determined by examining the incisors and " tush-like " teeth, but the expert can verify his opinion by noting the condition of the molars.

The incisors of the lower jaw are sharp teeth when new, and have no infundibulum or " mark " as in the horse. When worn, they have somewhat saddle-shaped table surfaces, especially the centrals and laterals.

The true canine teeth are larger and more powerful than the " tush-like " incisors and premolars. In the camel, unlike the horse, the true canines are preceded by deciduous ones, the last named teeth being very small in the upper jaw but larger in the lower. Moreover, these temporary canines of the lower jaw are exactly like

* A full description of Camel Dentition by the author of this article, with over forty original drawings, is being published by the Egyptian Government Press as a monograph, and it is hoped will shortly be available. When completed it can be obtained, either directly or through any bookseller, from the Government Publication Office, Ministry of Finance, Dawawin Post Office, Cairo.

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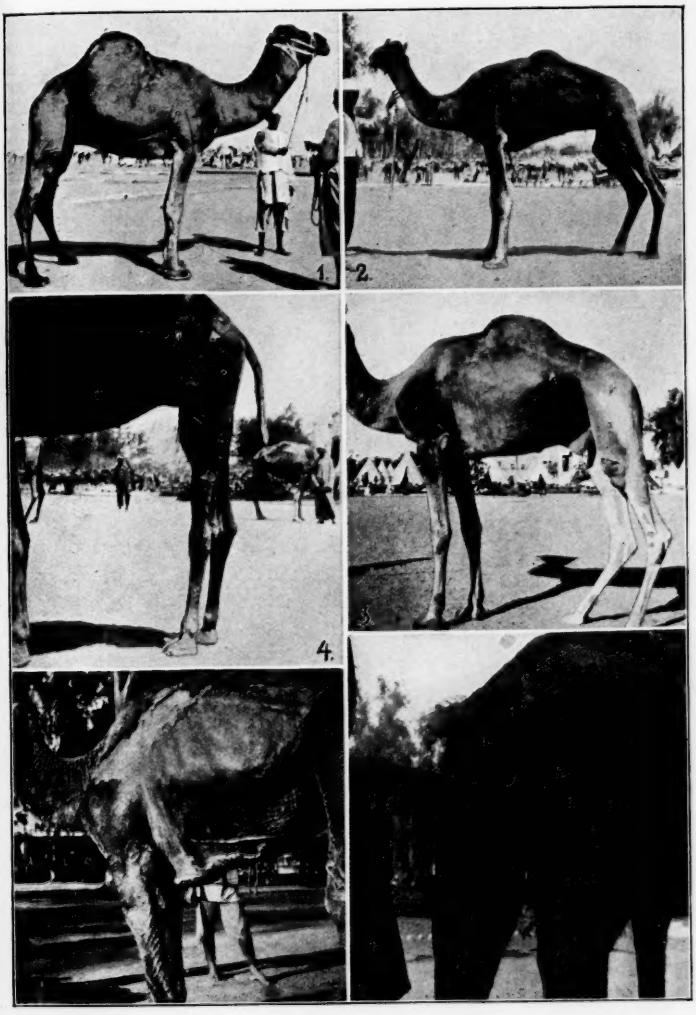

PLATE I.—1. A Good Type of Egyptian Baggage Camel. 2. Hind Legs too far back—"Over-shot" Fetlocks. 3. Soudanese Camel with "Sickle" Hocks. 4. Hocks too straight. (Algerian Camel). 5. A Severe Case of Mange. 6. A Case of Camel Pox.

incisors when erupted, being in apposition to and even overlapping the corner incisors. On the growth of the jaw, these teeth become separated from the incisors by a space and lose their incisor-like appearance by becoming triangular in shape and blunted—the base of the triangle being uppermost—and the necks representing the apices.

The arrangement and times of eruption of the teeth can well be seen from the following table.

TABLE SHOWING THE STATE OF CAMEL'S MOUTH AT DIFFERENT AGES.

Birth.

At birth there are usually no teeth actually through the gums, but the six incisors in the lower jaw and all the premolars, both upper and lower, can be felt.

One Week.

Incisors :	
Upper.	Nil.
Lower.	One pair.
Centrals.	Just appearing through the gum.
Laterals.	Nil.
Corners.	Nil.
Canines :	
Upper.	Nil.
Lower.	Nil.
Premolars :	
Upper.	Two pairs, coming up.
Lower.	One pair, coming up.
	Total teeth, 8 ; all temporary.

Two Weeks.

Incisors :	
Upper.	Nil.
Lower :	
Centrals.	One pair, well through, sharp.
Laterals.	One pair, cutting.
Corners.	Nil. These may be felt through the gum.
Canines :	
Upper.	Nil.
Lower.	Nil.
Premolars :	
Upper.	Two pairs.
Lower.	One pair.
	Total teeth, 10 ; all temporary.

One Month.

Incisors :

Upper. Nil.

Lower :

Centrals. One pair, well up.

Laterals. One pair, probably well through.

Corners. One pair, may be showing signs of piercing the gum.

Canines :

Upper. Nil.

Lower. Nil.

Premolars :

Upper. Three pairs. The last pair is not fully up.

Lower. Two pairs. The second pair is not fully up.

Total teeth, 14 or 16 ; all temporary.

Three Months.

Incisors :

Upper. Usually nil.

Lower :

Centrals. One pair } These teeth are all sharp and overlap
Laterals. One pair } each other in an "echelon-like"
Corners. One pair } manner.

Canines :

Upper. One pair, small and stump-like.

Lower. One pair, incisor-like, overlapping the corner incisors.

Premolars :

Upper. Three pairs. (The first single, the second and third double.)

Lower. Two pairs. (The first single, the second with three divisions to the crown.)

Total teeth, 20 ; all temporary.

Six Months.

Incisors :

Upper. One pair, very small like a pencil point, and never functions.

Lower. Three pairs, all overlapping each other.

Canines :

Upper. One pair.

Lower. One pair incisor-like overlapping the corner incisors.

Premolars :

Upper. Three pairs.

Lower. Two pairs.

Total teeth, 22. The temporary set is now complete.

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One Year.

Incisors :	
Upper.	One pair (*may* be lost).
Lower.	Three pairs, all temporary.
Canines :	
Upper.	One pair.
Lower.	One pair, still incisor-like, but separating from the incisors.
Premolars :	
Upper.	Three pairs, temporary.
Lower.	Two pairs, temporary.
Molars :	
Upper.	One pair above and below *may* just be seen appearing, immediately behind the temporary teeth.
Lower.	

Total teeth, 26 (temporary 22, permanent 4); or 20 (all temporary).

One Year and Six Months.

Incisors :	
Upper.	Usually nil.
Lower.	Three pairs still overlapping, but well in wear; temporary.
Canines :	
Upper.	One pair, temporary.
Lower.	One pair, temporary.
Premolars :	
Upper.	Three pairs, temporary.
Lower.	Two pairs, temporary.
Molars :	
Upper.	One pair, nearly up.
Lower.	One pair, nearly up.

Total teeth, 24 (temporary 20, permanent 4).

Two Years.

Incisors :	
Upper.	Nil.
Lower.	Three pairs, all showing wear, but not overlapping so much.
Canines :	
Upper.	One pair, temporary.
Lower.	One pair, temporary, becoming worn, flat at the top, and separating out from the incisors.
Premolars :	
Upper.	Three pairs, temporary.
Lower.	Two pairs, temporary.

Molars :
Upper. } One pair, above and below, well up and in wear.
Lower. }
Total teeth, 24 (temporary 20, permanent 4).

Two Years and Six Months.

Incisors :
Upper. Nil.
Lower. Three pairs, all showing wear but not overlapping, though still all temporary.

Canines :
Upper. One pair. This pair alters very little and is never in wear.
Lower. One pair, well back from the incisors and with a flat, broad wearing surface and a narrow neck.

Premolars :
Upper. Three pairs, still temporary.
Lower. Two pairs, still temporary.

Molars :
Upper. } One pair, above and below. The second pair may
Lower. } be showing.
Total teeth, 24 (temporary 20, permanent 4); or 28 (temporary 20, permanent 8).

Three Years.

Incisors :
Upper. Nil.
Lower. Three pairs, now becoming considerably worn and showing gap towards their roots.

Canines :
Upper. One pair, temporary.
Lower. One pair, temporary.

Premolars :
Upper. Three pairs, temporary.
Lower. Two pairs, temporary.

Molars :
Upper. } Two pairs both above and below, the second pair
Lower. } in each case being nearly up.
Total teeth, 28 (temporary 20, permanent 8).

Three Years and Six Months.

The only change in the state of the mouth at this stage from that at three years is the condition of the second pair of permanent molars, which are now well up and in wear.

Total teeth, 28 (temporary 20, permanent 8).

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Four Years.

There is still no great change in the state of the four-year-old mouth and no new teeth have erupted, nor have any been lost since three years was reached. However, the incisor teeth are becoming more separated from each other, especially towards the roots, and in some cases also at their table surfaces, which may be considerably worn.

The table surfaces of the premolar teeth are becoming quite smooth through wear, and the permanent molars are showing wear.

Total teeth, 28 (temporary 20, permanent 8).

Four Years and Six Months.

Incisors :

Upper. Nil.

Lower :

Centrals. The temporary are becoming loose, or may even have been lost, and the permanent pair may be showing.

Laterals. One pair, temporary, but usually much worn.

Corners. One pair, still temporary. These teeth lie at an angle and are much worn.

Canines :

Upper. One pair, temporary.

Lower. One pair, temporary, but much worn and slanting.

Premolars :

Upper. Three pairs, temporary, but worn quite smooth, and the second and the third pairs may be loose.

Lower. Two pairs, temporary, but worn quite smooth, and the second pair may be loose.

Molars :

Upper. } Two pairs, both above and below.
Lower. }

Total teeth, 28 (temporary 20, permanent 8) ; or 28 (temporary 18, permanent 10).

Five Years.

Incisors :

Upper. Nil.

Lower :

Centrals. One pair, permanent, nearly up, but showing no wear.

Laterals. One pair, temporary, may be much worn.

Corners. One pair, temporary, may be much worn.

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Canines :
- Upper. One pair, temporary.
- Lower. One pair, temporary.

Premolars :
- Upper. Three pairs. The first pair is temporary, the second and the third pairs may be temporary or may be permanent.
- Lower. Two pairs. The first pair is temporary, but the second pair may still be temporary, or the permanent may be seen.

Molars :
- Upper. } Two pairs, fully up and in wear, both above and
- Lower. } below (the third pair may occasionally be felt).

Total teeth, 28 (temporary 18, permanent 10) ; or 28 (temporary 12, permanent 16).

Five Years and Six Months.

Incisors :
- Upper. Nil (usually).
- Lower :
  - Centrals. One pair, permanent, well up and in wear.
  - Laterals. One pair. The temporary teeth may be lost and the permanent showing, or the temporary may still be present.
  - Corners. One pair, temporary, often mere stumps.

Canines :
- Upper. One pair, temporary as a rule.
- Lower. One pair, temporary as a rule.

Premolars :
- Upper. Two pairs. The small first temporary teeth have been lost (occasionally they persist) and the two pairs of permanent premolars can be seen coming up.
- Lower. One pair. The small first temporary teeth have been lost (occasionally they persist) and the permanent premolars are appearing.

Molars :
- Upper. Three pairs. The third and last true molars are now coming up.
- Lower. Three pairs. The third and last true molars are now seen.

Total teeth, 28 (temporary 6, permanent 22) ; or 28 (temporary 8, permanent 20).

Six Years.

Incisors :

Upper. One pair, permanent corner incisors, appearing as " tushes."

Lower :

Centrals. One pair, permanent and in wear.

Laterals. One pair, permanent, nearly up.

Corners. One pair, temporary and usually much worn.

Canines :

Upper. One pair, permanent.

Lower. One pair, permanent.

About this time the permanent " tushes " appear, even sometimes before the temporary are lost.

Premolars :

Upper. Two pairs, permanent.

Lower. One pair, permanent.

Molars :

Upper. Three pairs, permanent above and below, the third pair being only partly up.

Lower.

Total teeth, 30 (temporary 2, permanent 28).

Six Years and Six Months.

Incisors :

Upper. One pair, permanent, " tush-like," nearly up.

Lower :

Centrals. One pair, permanent and well in wear.

Laterals. One pair, permanent and in wear.

Corners. One pair. The permanent teeth are usually through.

Canines :

Upper. One pair, permanent.

Lower. One pair, permanent.

Premolars :

Upper. Three pairs, permanent. About this time a pair of anterior " tush-like " teeth appears, not replacing any temporary.

Lower. Two pairs, permanent. About this time the anterior " tush-like " permanent premolars erupt.

Molars :

Upper. Three pairs. Perhaps the third pair may not be fully up.

Lower.

Total teeth, 34 (all permanent); or 34 (temporary 2, permanent 32).

Seven Years.

Incisors :

Upper. One pair, permanent, " tush-like."

Lower :

Centrals. One pair, permanent, showing wear.

Laterals. One pair, permanent, showing some wear.

Corners. One pair, permanent, nearly up, but not quite in wear.

Canines:

Upper. One pair, permanent, growing larger than before.

Lower. One pair, permanent, growing larger than before.

Premolars :

Upper. Three pairs, permanent. The anterior " tush-like " pair is growing and becoming dark in colour.

Lower. Two pairs, permanent. As in the upper jaw, the " tush-like " pair is becoming darker and larger.

Molars :

Upper. } Three pairs, above and below, all in wear.
Lower. }

Total teeth, 34 ; all permanent.

At this age the camel has a " full mouth " of permanent teeth.

Eight Years.

By eight years of age the teeth are all in wear, including the corner incisors, and the four " tush-like " premolars have reached their full size and are by this time blackish in colour.

The true canine teeth have become very large and powerful. In the female camel the number and distribution of the teeth are the same as in the male, but the canines and the other " tush-like " teeth are smaller, and the anterior premolars may even be absent.

Nine Years and Onwards.

The correct ageing of the camel from eight years onwards requires great experience, and in the writer's opinion the correct age can only be approximated in many cases.

There are no " marks " or " Galvayne's groove " in the incisors as in the horse, and there are no hard and fast rules to go by.

The expert must be guided by the general appearance of the teeth, the amount of wear, especially as seen in the lower incisors and the size, thickness and colour of the " tushes."

As the age increases the lower incisors become worn, table surfaces are formed which are often saddle shape, the teeth separate away from each other, first noticeable at the roots, and finally,

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as the camel approaches twenty years of age, the incisors become stumps, and in very advanced old age they may be worn to the level of the gum.

The " tushes " become shorter, thicker, blunter, and darker in colour, and may in extreme old age, like the incisors, be worn down to the gum level.

The molar teeth become smooth on their table surfaces, and irregular corners which have not been in apposition to the opposite tooth may jut out to the detriment of the animal.

Separation of the incisors does not take place until the camel is about fifteen years old, and the gaps so formed gradually increase from this age onwards. The wear depends upon the natural hardness of the teeth themselves and on the nature and quality of the food, but especially on the former. Nevertheless, the expert can, with sufficient care and experience, arrive at a tolerably correct estimation of the age, taking into consideration the other general signs of old age.

No camel should be purchased for hard work before it is about six years of age. Up to four years old the young camel is not sufficiently well grown, and between four and a half and five and a half years of age the mouth is a complete wreck as regards the teeth. In this period of one year it obtains twelve or sixteen new permanent teeth and loses twelve or fourteen of the temporary ones.

The changes which take place are as follows :—

Two upper corner incisors *may* come through.
Two upper premolars (the first pair) are lost.
Four upper premolars are changed.
Two permanent molars (the third pair) appear.
Two lower central incisors are changed.
Two lateral lower incisors *may* be changed.
Two lower premolars (the first pair) are lost.
Two lower premolars (the second pair) are changed.
Two permanent molars (the third pair) appear.

Grazing, especially on rough herbage, is very difficult, and the camel is likely to " fall away " in condition if worked hard at this critical period of its life.

The camel is probably at its prime between seven and twelve years of age.

(*To be concluded.*)

Clinical Articles

OPHTHALMIA IN CATTLE.

By A. S. CANHAM, M.R.C.V.S.,
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THIS is a condition from which, in various parts of the Union of South Africa, many head of cattle suffer. As the disease has been and still is very prevalent at the School of Agriculture, one had the opportunities for observing the course of the disease under field conditions.

From the outset one would point out that the name " ophthalmia " was given to the disease by the farmers, but in the majority of cases it is technically incorrect, for only in some subjects of the disease does the condition develop into a true ophthalmia. Most of the cases show symptoms of a typical keratitis only. An eye that has been scarred by a permanent opacity, dense or otherwise, as a result of acute ulcerative keratitis is often popularly termed " white eye " or " hartebeest's eye."

Distribution.—Judging by the information obtained from farmers owning stock in different parts of the Transvaal and from one's own observations, one is inclined to think that the disease is often quite regional. As in cases of blackquarter, where of two farms lying adjacent to each other, one is a hot-bed of infection, while the other is clear of the disease, in the same manner cases of ophthalmia occur. From graphs obtained at Potchefstroom and borne out by observations of others, the disease is decidedly seasonal. In the summer, which is the rainy season of the Transvaal, most of the cases occur, but one does not wish to imply that cases of ophthalmia are absent during the dry weather; the incidence of the disease is usually markedly reduced. As a rule, only very few subjects of the disease are seen in the months of July, August, and September.

Ophthalmia does not occur with greater frequency among cattle pastured on damp places than among those grazing on dry veld. Again, cattle feeding in bush country, especially during the winter months, do seem to develop the disease more frequently than stock kept on ordinary grazing veld. The reason for one noticing this is that these animals form the few subjects of the disease that are observed during the dry season. Stock brought in during the winter for feeding in kraals often contract the disease. In these kraals one finds quite a number of flies, where outside flies are, comparatively speaking, rarely seen.

Virulence.—The virulence of this condition varies from year to year. Some years ophthalmia is quite mild, and the disease is quickly

controlled, but in other years very many animals are attacked, the course of the ophthalmia more prolonged, and, in addition, the disease, once it has broken out, is not so amenable to treatment by drugs.

Susceptibility.—The susceptibility of cattle varies. Figures compiled of cases of ophthalmia show that cattle belonging to the imported breeds are more frequently attacked than stock indigenous to the country. Of the progeny of indigenous cattle crossed with imported animals, the susceptibility toward ophthalmia is very low. Both male and female animals appear equally liable to contract the disease. Young stock from about eight months upwards seem more susceptible than do adult cattle. However, during the height of the ophthalmia season one usually has to treat about equal numbers of young and adult animals.

Methods of Spreading.—A question that has often been asked is: " Is ophthalmia contagious ? " and on this aspect of the disease one has tried to obtain some information.

The discharge from affected eyes was obtained by means of a small sterile cotton wool swab; to procure this the swabs were in some cases wiped (1) over the eyeball, (2) over the inner surface of upper and lower eyelids, and (3) over the eyeball and inner surface of the lids. The swabs obtained from these three sites were then wiped into healthy eyes. These animals were kept under close observation, but no ophthalmia resulted. Cows that were affected with the disease were tied up side by side with healthy cows, but results were negative. Finally they were tied head to head with the same results as the previous experiment. In addition we were frequently handling and working with animals which were the subjects of ophthalmia and also with healthy animals, but again we could not set up ophthalmia.

Some farmers suspected that flies excreted some substance on to the eyeball and set up inflammation of the cornea. A large number of flies from the cattle kraals were caught, placed in a large test-tube, and killed by chloroform fumes. About twenty flies (dead) were cut through between thorax and abdomen and saline solutions containing first head and thoraces, second abdomens, and third whole flies were made. The solutions were made by mashing up the parts in the saline. These different solutions were then dropped into healthy eyes and the animals kept under close observation. No ophthalmia resulted.

The presence of ticks in the ears has also been blamed for setting up ophthalmia. It is a common sight on smallholders' settlements to see some old Dutch lady kneeling on the neck of some unfortunate calf and pouring paraffin or other home-made remedy into the ears

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of the calf. On inquiring the reason for such treatment, one is told that the calf has sore eyes, and it is caused by ticks in the ears affecting the eyes. If one examines the eye one probably finds a bad opaque spot or ulceration present. Some time after seeing this first operation one had three sheep brought in for eye trouble. At the outset one was unable to make up one's mind whether or not it was sheep ophthalmia or due to minute grass seeds. While standing watching them one saw first one sheep and then another commence to scratch its ear with its hind leg, but if the hind leg struck the ear twice then about six times did the hoof rub the eye. Invariably one found that such ears that were being scratched harboured very large numbers of red ticks. One considers that this is probably where the farmer obtained his views on ticks causing ophthalmia from. He is right to an extent, for only indirectly does the tick cause the eye trouble, the actual cause being the scratching of the eyeball by the hoof. This point was raised in the *Farmer's Weekly*, May 19, 1923, by Mr. Paine, F.R.C.V.S., the G.V.O. of King Williamstown. His address to a meeting there contained the following: "You will notice that beasts often suffer from ophthalmia. This tick (Bont tick) in the ear is the cause of this, so by ear dressing you are killing two birds with one stone: you are killing the tick and preserving the eyesight of the animal."

Sir Arnold Theiler, in the *Farmer's Annual* of 1915–16, page 31, mentions the name of a moth which is commonly found round eyes of cattle, viz. *Ancyphora longivalis*; while Edmonds, in *Diseases of Animals in South Africa*, page 182, mentions a white and a brown moth. These were brought forward as another suggested cause of ophthalmia. Rhodesian students at the farm here have also told one that often moths are found round the eyes of cattle towards evening. We have never observed moths towards evening round the animals' eyes at the School of Agriculture, but frequently it has been noticed that animals that have been turned out on the veld about 5 p.m. quite sound in both eyes have returned in the morning with typical symptoms of a commencing acute ophthalmia in one eye.

The next suggested cause is the presence of a worm under the lids: it is no doubt identical with *Filaria lachrymalis*—now known as one of the Thelazia. These worms are thread-like, and vary in size from ½ inch to 1 inch, and are whitish in colour. Once one has observed them in the eye of an animal, they are easily seen again wriggling over the surface of the eyeball or disappearing under the membrana nictitans. After examining a large number of specimens under the microscope, one is struck by the preponderance of females over males. The method adopted for obtaining specimens was as follows: the

animal was secured by a rope to some fixture, and while an assistant steadied the beast, another held a pint jug that touched its face. It was placed in such a manner that the spout was below and slightly in front of the inner canthus. By keeping the upper lid slightly elevated and syringing the eyeball, especially under the membrana, all liquid and worms were caught and collected in the jug. If there is no sun it is practically impossible to see these worms wriggling in the water in the jug on account of their colour. If, however, the weather is sunny and one tilts the jug in such a manner that the brim throws a shadow into the water, the movements of the wriggling worms is thrown on to the bottom of the jug, and they can be taken out by means of a hooked piece of wire. These worms are extremely active, showing quite as rapid movements as the filiform larvæ of *Hæmonchus contortus*. Attempts were made to cultivate these worms, and a variety of substances was used as media.

In tap water worms die in less than an hour, similarly when placed on moist earth. In liquid obtained from badly watering eyes they still show life after a few hours. Worms placed in whey succumb after a very short time. In distilled water, distilled water and 5 grs. sodium citrate, tap water and 5 grs. sodium citrate, and in peptone water, they die within half an hour.

In 0·8 per cent. saline the worms live for about four to five days, the females dying first. Female worms, although apparently distended with eggs, would not pass them out. Some such females were cut up and the eggs placed in 0·8 per cent. saline and in tap water. A number of the eggs contained embryos, while others contained undifferentiated oval masses of protoplasm. These were kept at room temperature, and next day some embryos were hatched out, but no movements were seen. The next day more were hatched out, and these embryos showed decided movements. Their movements were slow and jerky, and consisted for the most part in coiling and uncoiling, and occasionally progression for a short distance followed by a long rest.

The question now to be considered is whether or not these worms set up ophthalmia. In Newman's *Parasitology* (McQueen), various authorities such as Guret, Klein, Goubaux, Baillet and Railliet, Rhodes, Coulom, Anceze, Randanne, etc., have seen the eye filaria, and some of these claim that the *Filaria palpebralis* of the horse and *Filaria lachrymalis* of cattle set up a conjunctivitis that may lead to ulceration of the eyeball, and even in some cases to loss of sight. On June 18, 1921, eight heifers suffering from ophthalmia in one eye were brought in for treatment. From most of the healthy eyes live worms of various sizes were obtained, but no worms could be found

in the affected eyes. One was of the opinion that possibly the tears from the diseased eyes were either more acid or alkaline than tears from healthy ones. Strips of litmus paper were moistened with both secretions, but from the tints obtained the liquid from affected eyes were slightly more alkaline than that from healthy eyes. The next day the healthy eyes were syringed out again carefully, but no worms were obtained. From one Friesland heifer were obtained thirteen eye worms. In the majority of calves whose eyes have been examined worms have been found, and one feels certain that 90 per cent. of the cattle on the farm here, with the exception of Afrikanders, which one has not had the chance to handle owing to wildness, have worms in the eyes. On February 14th six calves that came from the Cont. Abortion Camp were examined, although none showed ophthalmia. Some of these had at some previous time suffered from the disease. In four out of these six calves worms were obtained, but in eyes that had had ophthalmia no worms could be found. On March 17th three calves were taken—these had not been handled since February 15th, when eye worms had been obtained. Fries 112 yielded nothing—he was in good condition; Fries 113 yielded thirteen worms varying from $\frac{1}{4}$ inch to $\frac{3}{4}$ inch; in both of the calves there were no symptoms of any eye trouble, even traces of slight lachrymation being absent. Fries 114 gave thirteen worms on examination, but again symptoms were conspicuous by their absence. Fries 113 and 114 were not in good condition. Another calf born February 15, 1922, an Ayrshire about a month old, was subjected to examination, and worms were obtained from both eyes; no signs of ophthalmia were present. Ayrshire calf 138, three weeks old, was examined. Worms were obtained from both eyes, but no eye trouble was present. Worms have not, so far, been found, in spite of careful examination and syringing in calves from one day to one week old.

On April 19th an old Sussex cow, the subject of chronic styfziekte, died. Within five minutes of her death her eyes had begun to retract into the sockets, and on to the cornea of both eyes bunches of worms congregated. This cow had never suffered from eye trouble during her lifetime. On June 7, 1922, a Hereford cow that had at some time previous had its right eye poked out was examined as it stood in its stall. Protruding from under the membrana of the left eye a bunch of worms could be seen. The sound eye was syringed, and forty-five worms of all sizes were counted by myself and several students as we transferred the worms from the jug to different test tubes. This cow had never had ophthalmia, and up to the moment of writing has not had it.

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Attempts were made to see if one could not obtain some pathognomonic signs of worms in the eyes, so with this object in view calves were chosen that had been found free of worms by examining and syringing out the eyes. The details of the two one has given are the same for all calves used in this experiment :—

Ayrshire calf	Left eye	.. 2 female worms	January 20th
	Right eye	.. 1 male worm	
Fries calf	Left eye	.. 2 male worms	
	Right eye	.. 1 male and 1 female	

January 31*st.*—A very slight trace of dried watering was seen on close examination in both.

February 1*st.*—Right eye of Ayrshire was watering slightly and, below margin of left eye the merest trace of dried mucus. The left eye of Fries watered very slightly, while the right was clear. These were kept under observation till February 16th, and no ophthalmia resulted.

Worms were placed in guinea pigs' eyes, and no eye trouble resulted. In most of the eyes from which worms were obtained one noticed usually that some of the vessels on the sclerotic coat showed a slight injection, beyond that nothing could be found. In summer, autumn, and a part of winter one can obtain as many specimens of this worm as one wishes, but about September, in spite of careful examination, very few can be found. After examining a large number of affected eyes, and carefully syringing them out, only from about 5 per cent. of cases could one obtain even single specimens.

The *Agricultural Journal* of December 1912 had an article entitled " Inquiries into Dips and Dipping in Natal," in which it dealt with opinions of Natal farmers in regard to the prevalence of ophthalmia. They stated that with the onset of dipping ophthalmia became less. Edmonds, in *Diseases of Animals in South Africa*, states that with the regular and systematic weekly dipping of cattle the disease decreased considerably, and from some herds it disappeared entirely. Cattle at the School of Agriculture here are dipped regularly throughout the whole of the warm weather when ophthalmia is rife, but there seems no reduction in the number of cases of this disease.

To one's mind, flies, perhaps moths, or even some of the many small midge-like insects flying about, may play some part in causing this condition.

After examining a very large number of affected eyes in the first stage, one is struck by the fact that a small punched-out hole in the cornea can be found very frequently. In a large percentage of cases this is situated near either the internal or external canthus, and more often than not it is near the internal canthus that this hole is found.

This spot to me appears to be nothing more or less than a sting from a fly. Once the superficial layer of the cornea is ruptured, organisms, of which one can find a number of varieties in any healthy eye, gain entrance to the breach, take on virulent characters, and the disease commences. One is forced to the conclusion that the worms being so small are transferred by the mechanical agency of flies, moths, or midges. This point will be studied further as time and opportunity occurs.

Symptoms.—The symptoms as recounted by Sir A. Theiler in the *Farmers' Annual* of 1915–16, page 32, meet this heading, so can be given. The disease itself begins as a simple conjunctivitis, and at the same time there is a slight watery discharge from the eyes themselves. The eye is apparently painful, because the animal frequently keeps it closed (Theiler). The next alteration is found on the sclerotic coat of the eye ; here the small vessels become intensely injected, and from that onwards an opacity slight or dense appears on the cornea. In a large number of other cases the small " punched "-out ulcers become larger and deeper, and all around it a dense opacity is formed. As this progresses the ulcer and the area round it—even to the whole cornea—takes on a fleshy appearance. As times goes on the area involved becomes reduced in size, until all that remains is a small fleshy button over the original site of the ulcer. Gradually this button is replaced by white fibrous tissue, which forms the permanent opacity—hence the term " white eye." In severe cases the end result is a permanent conical eyeball, with the point of the cone bulging externally ; in others, again, the condition terminates in the eyeball being entirely opaque and bulging ; here the tension appears to be much increased. The discharge is at first watery, but as the disease increases in intensity it becomes more mucous in character. This is very noticeable in white-faced animals. In a very large number of cases only one eye is affected, but both eyes may suffer at different times ; exceptionally, both may be affected at the same time.

One attack of ophthalmia in one eye appears to set up an immunity in that eye, but at some later date the other may become affected. Now and again an old affected eye may be the subject of another slight attack of ophthalmia, but this is not usual.

The temperature of affected animals remains normal throughout the disease, while blood-smears, taken at different times from diseased animals, shows nothing abnormal. There are no constitutional symptoms.

Treatment.—Many and various have been the remedies and drugs mentioned in the treatment of this disease, and so far no one can lay claim to have discovered a specific. The nearest approach to a

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specific is a remedy of unknown prescription made by a returned soldier and sold as a proprietary preparation. The injection of Lugol's tinct. of iodine above the eyeball into the pad of fat behind the eyeball has been extolled. If the disease has been seen in the watering stage, and then treated with Lugol's, one often obtains good results; but other drugs act quite as well, and need only to be dropped into the eye without a hypodermic injection. This statement refers to a number of popular lines of treatment, such as corrosive sublimate 1–1,000, boracic acid (saturated sol.). Powdered boracic acid or calomel is often blown into the eye. Red lead placed in every four days is said to be of use.

While treating cases here, all these drugs and many others such as silver nitrate 1–4 per cent., Government wireworm remedy in solution, copper sulphate sol., potassium permanganate sol. 1–5 per cent., formalin 1–1,000 to 1–200, yellow oxide of mercury ointment, phys. saline, hyposulphite of soda 2–4 per cent. distilled water, cocaine and tinct. of iodine (Mitis), have been used, but not one can be said to reduce the duration of the disease materially. Certain farmers claim that eyes left alone clear as soon as those treated.

One's best results were obtained by using formalin 1–300, provided no ulceration occurred; when ulceration was present, 2 per cent. hyposulphite or phy. saline soltun. (warmed in both cases), with about 5 minims tinct. of opium to the ounce of water, were useful. In the later stages yellow oxide of mercury or calomel, and if pannus was present, in spite of no watering, alum 4 per cent. was found to be quite useful.

The secret of treatment seems to be not to use one drug too long; use for two or three days, and then start another. This point is brought out by Edmonds in *Diseases of Animals in South Africa.*

A POINT OF TECHNIQUE IN CASTRATION.

By Lieut.-Colonel J. W. RAINEY, C.B.E., M.R.C.V.S.,
London.

The technique of the operation of castration of colts, as described in text-books and as generally practised, may be improved in one respect.

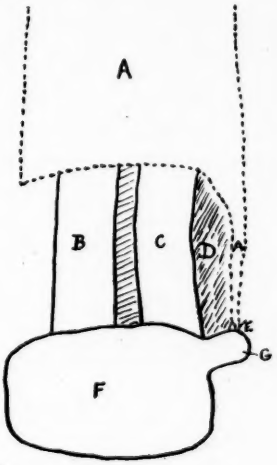
When the testicle is drawn through the incision in the scrotum, the opened *tunica vaginalis* falls clear of the spermatic cord on its anterior or vascular side, but remains caught up to the epididymis on the posterior or non-vascular side.

The operator customarily ignores this circumstance and takes up in his écraseur, clams, or other instrument, the entire cord,

together with that portion of the tunica vaginalis which remains adherent to the epididymis. He thus crushes, and by his subsequent incision or searing unnecessarily mutilates and exposes to infection a considerable portion of the tunica vaginalis.

This may be avoided by cutting through the fibrous matrix which is found at the fine point of junction between the epididymis and the tunica vaginalis.

To effect this, the operator, while exerting traction on the testicle with his left hand, hooks the index finger of his right hand through the membranous tissue which lies between the non-vascular portion of the cord and the fold of the tunica vaginalis, thus clearly



A, Tunica vaginalis outlined by dotted line.
B, Vascular portion of cord.
C, Non-vascular portion of cord.
D, Membranous tissue between non-vascular portion of cord and the attached fold of *tunica vaginalis*.
E, Point of severance.
F, Testicle.
G, Epididymis.

defining the latter as a tapering ligament-like formation passing to its point of attachment to the epididymis.

It is then easy to insert the knife through the opening made by the finger and to cut through the distal end of the fold of the tunic just where it joins the epididymis.

This releases the tunica vaginalis entirely from all attachment to the testicle, so that it falls back and leaves the spermatic cord free to be drawn out and clamped clear of any covering.

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The advantages of this method are evident, both in the far greater ease of severing the cord, and in the absence of subsequent swelling and constitutional disturbance.

This method was brought to the notice of the writer by an Australian stockman in the colony of Fiji during a series of more than one hundred operations carried out under climatic and other circumstances that were unfavourable to successful surgery.

Pairs of cases operated on respectively by this method and the usual way were many times compared, and it was conclusively shown in every instance that the former method (as described in this article) was far to be preferred.

A little practice is required to locate exactly the membranous tissue that lies between the non-vascular portion of the cord and the fold of the tunic. At first there is a tendency to thrust the finger between the vascular and non-vascular elements of the cord.

There can of course be no doubt that this point of technique is practised by some operators, but so far as the writer can gather from the experience of those with whom he has discussed the matter, and from the text-books he has consulted, it is not generally known by practitioners, nor is it taught in the veterinary schools.

A rough diagram, which is appended, may serve to illustrate the written description.

FRACTURED TIBIA IN A POLO PONY FROM A HIT WITH A POLO BALL.

By Captain C. H. S. TOWNSEND, O.B.E., M.C., R.A.V.C.,
Quetta, India.

During a game of polo at Quetta in June of this year a nine-year-old Australian polo pony belonging to Captain Hare, 60th Rifles, was struck on the inside of the off tibia with an ordinary polo ball.

The ball had been hit with a back-handed stroke from about 20 yards away; it did not appear to be travelling very hard, and Captain Hare's pony was going towards it at a slow pace when she was struck.

Directly the pony was hit, she stopped, carrying the leg, and it could be seen at once that the tibia was fractured, so she was destroyed.

Post-mortem showed a plain oblique fracture about 5 inches from the upper end of the bone.

This case shows how little force is required to fracture a tibia, as the ball did not appear to be travelling very fast at the time of impact.

It is also generally thought that a polo ball will not cause much damage, and I believe General De Lisle states in his book on polo that a polo ball never injures a pony.

DEFORMITY OF THE TRACHEA.

By Captain C. H. S. Townsend, O.B.E., M.C., R.A.V.C.,
Quetta, India.

Subject.—An eight-year-old L.D. Australian gelding in very good condition belonging to a signal unit.

Reported to me in June 1922 as unable to do its work owing to roaring. It had been with its present unit about one year, doing ordinary work, nothing unusual being noticed until about a month previously.

Symptoms.—Breathing quite normal when standing still or at a walk. On being cantered made a deep roaring noise after going about 100 yards, and after a quarter of a mile pulled up, breathing very hard, making a loud noise, and altogether very distressed.

The noise was made both during inspiration and expiration, and was quite different to the ordinary " roarer."

External manipulation of the trachea and throat failed to find any cause for the condition, and examination of the pharynx yielded negative results.

Diagnosis.—Not definite. Probably a tumour or some other obstruction in the larynx or nasal chambers.

Treatment.—The animal was chloroformed, the larynx opened (as for the roaring operation) and examined, but everything appeared normal. After the larynx wound had healed, an ordinary tracheotomy tube was inserted about 10 inches from the upper end of the trachea. As this did not relieve the symptoms in any way the case appeared hopeless and the animal was destroyed.

Post-mortem.—Examination showed no obstruction in the way of a tumour, etc., but the trachea was of a most peculiar shape, and it was to this that I put down the whole trouble. Instead of almost round, it was found to be flattened from side to side, so that its lumen was almost obliterated and the sides in some parts were almost touching each other.

This conformation extended in some degree throughout its whole length, but was much more noticeable in the thoracic than cervical portions.

The interesting points about this case are :—

(1) The failure to diagnose it during life. The trachea was manipulated several times, but nothing unusual was felt. The animal, as previously pointed out, was in very good condition with a very coarse, thick neck ; if this case had occurred in a well-bred, thin animal it could probably have been detected during life.

(2) How the deformity came about and if it was congenital or not ?

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If it had been congenital it is unlikely that the horse would have been able to do its ordinary work until it was eight years old without it being noticed. On the other hand, there was nothing to show on the horse's veterinary history sheet that he had ever received any injury which might have caused the deformity.

Since writing the above I notice that a similar case has been recorded by Captain Plunkett, R.A.V.C., in a mule. It would be interesting to know if these cases are at all common. I have never previously heard of one, neither do I know of any literature on the subject.

PREGNANT COWS IN ŒSTRUM.

By E. MORGAN, F.R.C.V.S., D.V.H.,
Puerto Cabello.

The question is often being asked in different journals whether it is possible for a cow to be in œstrum ("returning to the bull") when she is already pregnant.

Having been in charge for several years of some extensive breeding stations in Venezuela, where imported British-bred bulls are used in order to improve the native breed of cattle, has given me an opportunity of studying this question, so now I am able to state definitely that it is quite a common occurrence for cows to manifest symptoms of œstrus although they are heavy in calf.

The first year when I took charge of these breeding stations where the imported bulls are being kept indoors, except for a few hours in the early morning, and in the cool of the evening, when they are turned out to the yards, where the cows are brought in from the fields and kept in the yards over night, I was at first doubtful of what the native cowboys used to tell me that some of these semi-wild cows were pregnant when they manifested symptoms of being in œstrum. If within two months the cows do not return to the bull after being served the last time, they are then turned to a field apart from the other cows, so as not to bring them all in every night to the yards. When passing this particular field I often noticed some of these cows manifesting symptoms of œstrus. At first I thought it was an excuse offered by the cowboys when they stated that these cows were in calf, in order to avoid the trouble of bringing such cows to the yards to be served by the bulls, in spite of the fact that many of these cows appeared to be already in calf. Furthermore, we knew that they had been served many months previously. However, when the cows were brought to the yards, they would stand quietly to be served by the bull. It was

more mysterious still to find that these cows would calve strong, healthy calves within two or three months following the last service of the bull.

I shall mention one particular case which occurred about three months ago. Whilst passing through a field I noticed a red-polled in-calf cow trying to mount another cow, but the latter would not "stand," but the in-calf cow would stand quietly for the other cow. They were both brought up to the yards, and a Hereford bull was turned out, which soon served the polled in-calf cow several times, but he was not in the least interested in the other cow. The red-polled cow calved in two months' time from that date, a nice healthy half-bred shorthorn calf, as it was a shorthorn bull which had previously served her.

In a herd of cows here one must not expect to find all the in-calf cows returning to the bull, but it is nothing unusual for us to see a few such cases in the course of a month. The natives believe that the *majority* of cows show signs of œstrus at the end of six or seven months' pregnancy. This is not correct, because by bringing all the cows to the yards every evening, and a service book being kept, we are thus able to trace each case accurately. The natives say that this œstrus period comes on when the fœtal calf *in utero* is forming hair, "cuando el pelo va a formandose en el becerro."

Why should a percentage of these already impregnated cows manifest such symptoms after a lapse of six or seven months? It would be interesting to know the experience of others in tropical or subtropical countries, as I can never recollect seeing a single case of the kind in Great Britain.

Is it possible that a certain breed of cattle manifest more than others what we might term these abnormal symptoms? Or has a certain class of pasturage any effect, such as stimulating the generative organs? The breed of cattle in Venezuela as well as in Brazil originated from Spain. Anyone who has visited the London Zoological Gardens may have seen the two Brazilian cows which are there.

Ewart says: "The mare may mature and discharge one or more eggs after she has become impregnated; this is known to occur in other animals, including man, and accounts for superfœtation or the production of a second conception in an animal already pregnant. The period of œstrus is not necessarily identical with the period of ovulation; œstrus may occur without ovulation, and ovulation may occur without œstrus" (Smith's *Physiology*).

So far, in all the cases which I have observed here, there has not been a single case of second conception.

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AN UNUSUALLY INTERESTING CASE OF MILK FEVER.

By H. B. COLLET, B.V.Sc., M.R.C.V.S.,
Tring.

THE subject was a cross-bred Jersey of good quality which had "dropped" at her previous calving. At this last calving she had calved on the morning of September 13th. Last thing at night she was apparently quite all right, but the following morning was found down and quite unconscious. The response to treatment was quite good, but by the following Sunday evening, the 16th, she had "dropped" in all four times. The ordinary treatment of udder inflation was carried out with hypodermic injections of atropine and adrenalin and ammonia and nux vomica orally.

KERATITIS PIGMENTOSA IN THE DOG.

By HENRY GRAY, M.R.C.V.S.,
London.

THIS is a very common disease in the dog, and yet I have not seen it described anywhere than in my own writings on the subject, and in particular in Nicolas's *Veterinary and Comparative Ophthalmology*.

Although in a very great number of cases there may not be any signs of active inflammation of the cornea, there are in many others minute vascularity of the membrane with a catarrhal discharge from the eyelids. It attacks both eyes, and if it abates under treatment it recurs time after time until the whole cornea becomes blackened and the sight is abolished or at least diminished. It attacks mostly Pekinese, Griffons, Pugs, Bulldogs, Aberdeen Terriers, and Fox Terriers, but no breed living in confinement is exempt.

This pigmentary condition is rarely noticed by the owner, and in numerous instances it runs a silent course. It is seen as much in dogs with very little normal pigmentation of the scleral conjunctiva as in those that have a great deal of it. It may attack several dogs in a particular kennel. There is no doubt it is due to defective hygiene and unsuitable or deficient feeding. It is not seen in dogs living practically out of doors and on the coarsest of food or on filth.

So far as I am aware, it is not seen in other domesticated animals, and is not described in text-books on human ophthalmology. It seems to affect only one eye. It should be differentiated from the acute conjunctivitis with chemosis seen so often in young cats affected with distemper in which there is often a great deal of catarrhal discharge.

Cocaine and adrenalin give a certain amount of relief, but they do not cure the malady.

Is this affection due to some deep-seated affection of the eyeball, and the swollen conjunctiva is only an external expression of it? Or is it simply a conjunctival affection producing by its swollen condition pressure on the cornea as to alter its nutrition and set up ulceration and perforation? Apparently early paracentesis of the anterior chamber is the most rational treatment.

Œdematous chemosis without inflammatory congestion is sometimes seen in the cat, disappearing rapidly by the installation of adrenalin.

FLINT STONES IN THE STOMACH OF A DOG.

By WALTER GREY, M.R.C.V.S.,
Ilford.

On the 14th of August I was cabled to examine an Airedale terrier twelve months old. The animal appeared in normal health, took his food regularly, and was not at all sick, but on palpating the region of the stomach I was able to produce a sound such as would be caused by tapping a bag of marbles. I diagnosed the presence of stones in the stomach, and prescribed stodgy food for twenty-four hours, and then a dose of liquid paraffin. The result was not satisfactory, and on the 21st I gave $\frac{1}{10}$th grain of apomorphine hydrochlor. In a few minutes the animal vomited and brought up three flint stones, weighing altogether 7½ ounces. After this treatment the animal began to vomit and refused any food or drink, except a little water. Forceable fed dog from this point with Brand's essence, but could keep nothing down except a little milk and whisky. I prescribed a bismuth mixture which stopped the sickness, the animal being greatly reduced and extremely weak. On August 29th a flint stone was passed which weighed 1½ ounces, after which the bowels acted freely and the dog made a rapid recovery, although it was discovered there were still stones in the stomach. Animal having regained sufficient strength, I decided on September 3rd to give another emetic, which resulted in the dog vomiting two more large stones, weighing 7 ounces together. The total weight of stones so far recovered is 16 ounces exactly. Dog appears to be free of stones. The remarkable thing to me is that the dog kept so well with all this weight in his stomach for the first week.

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ARTIFICIAL INSEMINATION IN A BITCH.

By Major FRANK CHAMBERS, O.B.E., F.R.C.V.S.,
Wolverhampton.

An interesting case of artificial insemination in a bitch, which I consider worth recording, came to my notice a few months ago.

A lady breeder of Pekingese wished to mate an old dog with a fifteen-month-old bitch. The bitch was very shy, but the dog, becoming very excited, ejected his semen before reaching the bitch. This happened twice. The owner would not use another dog as she was particularly anxious to obtain puppies from this particular mating.

Later in the day the dog was tried again, but the same thing happened. This time the semen was collected in an egg-cup, drawn in a half-ounce male glass syringe, and injected into the vagina of the bitch.

As a result, five beautiful puppies were born in due course.

Two weeks after whelping this bitch had a very severe attack of eclampsia (?), but made a good recovery.

RICKETS IN THE ARGENTINE.

By E. MORGAN, F.R.C.V.S., D.V.H.,
Puerto Cabello.

Lieut.-Colonel T. Dunlop Young's article in the August issue of the Veterinary Journal dealing with the above subject was most interesting reading to me, who happens to reside at present in a district where rickets is most prevalent. Although he states that he cannot define the cause, nevertheless he used a remedy which proved efficacious. This is very satisfactory, and it proves to us that it is not absolutely essential to know the exact cause of a disease before a curative treatment can be discovered. Professor Schmidt discovered a cure for milk fever, but up to the present day no one can definitely state the exact cause of this prevalent malady of lactiferous animals.

This farm, where rickets is prevalent, consists of about 1,000 acres of tableland, where previously sugar-cane used to be cultivated for at least fifty years before the present company took it over a few years ago and planted it with native grass. I mention this as it might give someone a clue as to the cause of rickets, because sugar-cane drains the land of its carbohydrates to such an extent that after a few years, unless the land is well manured, the percentage of sugar in the cane gets too low to clear the expenses of cultivating, crushing, etc.

Surrounding this tableland is a range of hills, where short, wiry

grass springs out from this sparry and arid ground. These animals roam at will on the flats as well as on the slopes of these hills.

Although cattle, horses, and donkeys are kept on this farm, as well as a few sheep (but the horses are not bred here, they are bought elsewhere for the purpose of tending the cattle), what seems to me most mysterious and complicated is that only donkeys suffer from this disease. I estimate that about 20 per cent. of them suffer, and the majority of cases in the fore-limbs only, which are pointing to several directions on the surface of the globe at the same time, as they are so badly twisted. Many of them manifest these symptoms when only a few months old.

Regarding the Causes.—Of the cases which occur here, we can dismiss the following, viz. : lack of exercise, lack of sunshine, as the latter hardly fails except at night, lack of fresh air, bad housing, and dampness. These animals are never housed. I think we must therefore confine ourselves to the improperly balanced diet or lack of vitamines. I may also state that this land is deficient in phosphates and lime. The time that the animals properly relish the grass is soon after it springs up from the soil, after burning the surface growth. Even before the grass springs up the animals are craving for the ashes, which they lick clean off the surface of the ground. It is a custom here to burn the land in every case before planting grass and maize in order to fertilize it by what little phosphates the surface growth contains, whether the latter consists of grass, shrubs, or trees, otherwise the crop yield will be very light.

I hope this will interest some reader who might be able to reflect a glimmer of light on the cause and prevention of this disease, and to advise us why donkeys suffer where cattle are free from the disease, although grazing on the same land ; yet the latter are in the majority by 20 to 1.

Review

Bibliography of Hookworm Disease. Publication No. 11 of the Rockfeller Foundation International Health Board, New York City, 1921.

This Bibliography is prefaced by an Introduction which gives a full historical account of hookworm disease from the first authentic mention in an Arabian MS. by Avicenna, is of great interest to us. First because of the importance of the work done by Edoardo Perroncito, Professor of Pathology at the Veterinary School of the University of Turin, and secondly because we are concerned to know to what extent animals are carriers of the disease.

In 1782 the worm was discovered by Goeze in a badger, but the name Haakenwurm or hookworm was bestowed by Froelich, who in 1789 found

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these worms in a fox. Hookworms were discovered in man in 1838, and, in 1878, the method of fæcal diagnosis was established by Grassi and the brothers Ernesto and Corrado Parrona.

During the making of the St. Gothard Tunnel in 1880 a bad outbreak of the disease then known as miners' anæmia aroused the interest of Perroncito, who alone of all the scientific investigators insisted on the parasitic origin of the disease, and further established the fact that miners' anæmia, a disease incident mainly to warm, moist mines or to sub-tropical climates, was really hookworm disease. It was Perroncito, too, who proved that the cure was a vermifuge. He suggested a 1½ per cent. solution of thymol, but preferred extract of male-fern ; thymol continued to be the favourite drug until 1917, when oil of chenopodium, introduced in 1900, took its place. A bad outbreak of the disease, disseminated by miners from St. Gothard Tunnel, followed throughout the mines of Europe, and though it was some time before Perroncito's views were accepted, the epidemic, which had spread into Germany, Belgium, France, and Holland, was finally subdued by the means suggested by him. The method of infection was not discovered until 1898, when Arthur Looss, Professor of Parasitology at the Medical School of Cairo, was able to prove that infection took place through the skin.

The disease was not recognised as such in the United States until 1893, although in one Southern State it had long been a serious menace to health. Since 1910 much work has been done there, and travelling clinics established to control the ravages of the disease.

Animals were at first suspected of spreading the infection, but it has been proved that the hookworm found in animals is not the same as the human hookworm. Nevertheless, pigs, chickens, and such animals as act as scavengers may pass the infective larvæ unharmed through the intestines or carry them on their feet from place to place.

This brief fifteen-page account of the history of the disease is written with the utmost exactness and great clarity. The Bibliography itself contains no fewer than 5,680 references from 824 periodicals, in addition to treatises and unpublished MSS. in the Rockfeller Institute.

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